

CHAPTER R

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R.00 General

(A) The snow removal and ice control family (HM6R), includes all work in connection with the following:

- (1) Snow removal operations;
- (2) Drift prevention;
- (3) Installation and maintenance of snow fences;
- (4) Snow pole installation and removal;
- (5) Tire chain fabrication and repair;
- (6) Maintenance and control of chain control locations;
- (7) Avalanche control.

The program also includes truck haul of snow to waste areas, opening drains covered by snow and ice and the spring opening of roads that are normally allowed to close for the winter season. Mechanical and manual sanding and the use of deicing agents, both solid and liquid solution types are also included.

Refer to Volume 2 of the Maintenance Manual for administrative procedures to be used in connection with this work.

(B) Terminology:

- (1) Deicer

Deicer is a chemical freezing point depressant such as, but not limited to, salt (sodium chloride), CMA (calcium magnesium acetate), liquid potassium acetate, or liquid magnesium chloride. Deicers are used to melt already formed frost, snow, or ice.

- (2) Anti-icer

Anti-icer is a chemical freezing point depressant, used to prevent the formation of frost, snow, or ice on a road surface.

(3) Pack

Pack refers to a buildup of ice and/or compacted snow on the road surface.

(4) Bare Pavement

Bare pavement means the road is clear of loose snow but may have patches of ice or snow pack that, when treated with chemicals or abrasives or a combination of these, may be negotiated safely by the average driver without the need of chains.

(5) RWIS (Road Weather Information System)

The RWIS is an installation of weather and pavement sensors that is used to monitor conditions at a remote location. Some RWIS can use historical data previously gathered to predict local weather as a decision making tool for maintenance and construction operations.

(6) Chain Requirements

Chain requirement means chains or traction devices will be required when, in the judgment of the maintenance supervisor on duty, snow and ice conditions make it difficult for the average driver to control their vehicle. Chains or traction devices are defined in the California Vehicle Code Section 605, generally called "chains", and are used to increase the traction of vehicle tires on snow or ice covered pavements.

(7) ATDs (Automatic Traction Devices)

ATDs or automatic traction devices as defined in the California Vehicle Code Section 605, are devices that can be automatically deployed by the driver of a vehicle. These devices are most commonly found on trucks and buses.

R.01 Policy

In compliance with Section 95.6 of the California Streets and Highways Code, Caltrans adopted the following policy in July, 1992:

"Snow removal and ice control shall be performed as necessary in order to facilitate the movement and safety of public traffic and shall be done in accordance with the best management practices outlined herein with particular emphasis given to environmentally sensitive areas".

This policy is outlined in the Caltrans report to the Legislature in response to Chapter 318, Statutes of 1991 (Hauser), "The Use of Deicing Chemicals on California State Highways" July, 1992.

- (A) Through coordination with the Maintenance Program Manager, each District is responsible for preparation of detailed operational guidelines for their individual snow routes. These will be based on overall needs.

Factors to be used in determining these needs are:

- (1) Average daily traffic (ADT).
- (2) Congestion and traffic delay.
- (3) Safety.
- (4) Availability of alternate routes.
- (5) Consequences of not providing appropriate level of service.
- (6) Public interest and concern.
- (7) Potential economic impact.
- (8) Environmental considerations.

Final determination in levels of service will consider cost and budgetary constraints.

- (B) In addition, Districts are to comply with the following requirements regarding their snow and ice control programs:
- (1) Maintain accurate records of the locations and quantities where salt and other deicers are used.
 - (2) Provide necessary training for maintenance personnel involved in snow and ice control efforts.
 - (3) Calibrate equipment used to apply deicing chemicals or abrasives.
 - (4) Identify areas which are potentially environmentally sensitive. This includes vegetation areas and bodies of water receiving direct roadway runoff.

- (5) Submit to the Manager, Maintenance Program, an annual Snow Plan for the next winter season, including proposed levels of service, chemical usage, and any proposed changes to operations in environmentally sensitive areas.
- (6) At the close of each winter season, each District is to submit to the Maintenance Program Manager a complete report containing the data indicated in points 1 to 5 above.

Included in this report will be a discussion of the following:

- (a) Use of salt and other deicers for snow and ice control,
- (b) Results of reevaluation of procedures,
- (c) Mitigation measures used; and
- (d) Other information related to the use of deicers on safety, economy of operations, and environmental impact.

This report will specify the quantity of salt and other deicers used by County, Route, and Post Mile.

It will also include a recapitulation of the salt inventory at the beginning of the season, the quantity of salt received during the season and the inventory of salt on hand at the end of the season. The same usage information is required for all other deicers used.

R.02 Maintenance Levels

Snow removal and ice control are necessary to provide as safe a travel way as possible and will balance traffic demands, amount of traveler delay, and environmental impacts. It is expected that R-1 and R-2 chain controls will need to be used on some routes. All roadway segments subject to snow and ice conditions will be designated with a Snow Road Classification "A", "B" "C", "D", or "E". The level of service to be provided will be dependent on this classification of each segment.

Snow Road Classifications are defined as follows:

(A) Snow Road Classification "A"

Snow will be removed continuously during a storm to keep the road open for traffic except when poor visibility or avalanche hazard exists. Chain requirements will be lifted and the roadway returned to bare pavement as soon as possible. Patrols will be established for those areas where conditions require surveillance of the roadway for possible snow, ice or avalanche hazards. Deicers or abrasives or a combination of both should be applied to enhance traffic safety as deemed necessary by the supervisor on duty.

(B) Snow Road Classification "B"

This level is the same as "A" above, except that, chain requirements will be lifted and bare pavement achieved within 48 hours after the end of the storm.

(C) Snow Road Classification "C"

At this level, only enough snow should be removed during the storm to keep the road open and safe for traffic. Around the clock shifts may be necessary to accomplish this.

Deicers or abrasives or a combination of both should be applied to enhance traffic safety as deemed necessary by the supervisor on duty.

Patrols will be established for those areas where conditions require surveillance of the roadway for possible snow, ice or avalanche hazards. Deicers or abrasives or a combination of both should be applied to enhance traffic safety as deemed necessary by the supervisor on duty.

(D) Snow Road Classification "D"

Snow should be removed only during normal daytime work shifts, except that some routes may be plowed at any time when the District Director determines there is sufficient reason for plowing. Some routes may be allowed to close temporarily during moderate to heavy storms when the District Director determines this to be the appropriate course of action. Once open, deicers or abrasives or a combination of both should be applied to enhance traffic safety as deemed necessary by the supervisor on duty.

(E) Snow Route Classification "E"

These routes are allowed to close during the winter and are reopened in the Spring when it is reasonable to assume the storm possibilities are over.

R.03 Organization and Practice

District Division Chiefs of Maintenance, Maintenance Managers and Area Superintendents shall make advance preparations so that snow removal work can begin with the first storm. Weather forecasts and temperature readings must be monitored frequently during the winter season.

The RWIS should be utilized if available. Regularly assigned crews should be supplemented by transfers from non-snow areas, personnel from other agencies by interagency agreement, permanent intermittent limited term personnel and temporary help personnel as available.

Close cooperation, good communications and application of the principles of teamwork with members of the California Highway Patrol (CHP), local law-enforcement and other governing agencies are essential for successful snow removal operations.

Roads having extremely light winter traffic, where the expense of snow removal is not justified, are closed after the first significant snow.

Excepting Sno-Parks, established State maintained parking areas, and under properly executed Maintenance Agreements negotiated with other agencies, State forces shall not remove snow beyond the right-of-way line. Property owners may clear snow from driveways within the right-of-way and deposit that snow only on the portion of the right-of-way not used by vehicles or pedestrians. No snow from other portions of private property shall be deposited on the right-of-way.

In business districts where snow cannot be blown out and there is sufficient roadway width, snow may be plowed to the center of the road for later removal.

Where openings are made in center of the road snow berms for left turns and cross traffic, the openings should be made wide enough to provide a reasonable sight distance. When temperatures warm sufficiently for melting, center of the road snow berms may be spread as a thin layer on the traveled way as a method of snow removal in lieu of expensive snow hauling.

At resorts and clubs where parking may be continuous over storm periods or for overnight or weekends, space for parking should be provided by the resorts or clubs beyond the right-of-way.

If cars are parked within the right-of-way, it is the responsibility of the resort or club officials to have such cars moved, if snow removal equipment is expected to clear the area. If private vehicles are parked on the traveled way, the CHP should be requested to remove the vehicles.

A preferred method of controlling pack is mechanical removal. Sufficient deicer chemicals may be applied at the beginning of a storm to deter bonding and minimize the buildup of pack. When pack does build up, chain controls can be utilized as appropriate to provide safe travel conditions until the surface has been treated with abrasives or bare pavement conditions are achieved.

When possible freezing conditions are anticipated, special patrols should be scheduled for the detection and correction of slippery conditions. Particular attention should be paid to curves, intersections, grades and problem locations such as shaded areas and bridges. Anti-icing liquid deicers can be applied, sometimes many hours in advance of anticipated freezing conditions, to prevent frost and ice from forming and reducing the need for some after-hours patrols.

(A) Areas of Special Consideration

(1) Bridge Decks

Salt applied to bridge decks can cause corrosion damage to structures and should be used with caution. Non-chloride chemical deicers are recommended whenever possible. At lower elevations, slippery conditions on bridge decks can often be mitigated by use of properly constructed chip seals. Application of abrasives and non-chloride deicers can be used to control frost.

(2) Railroad Grade Crossings

When removing snow at railroad grade crossings, every precaution should be taken to ensure that ice, snow, abrasives and other debris is not deposited and left on the crossing. When engaged in plowing activity at railroad grade crossings, plow trucks must come to a complete stop, adjust the plow to clear all obstructions and carefully cross the tracks before resuming regular plowing. This procedure will prevent damage to the tracks and plowing equipment.

(3) Snow Fence and Jet Roofs

Inspect annually and repair, preferably two or three months prior to anticipated snowfall.

(B) Snow Pole Policy

Snow poles used for delineating the highway should be replaced if damaged, or reinstalled where removed, before the first snowfall. These should be placed at the shoulder edge in accordance with policy.

Snow poles are an essential element in almost all snow removal operations. The basic purpose of a snow pole is for guidance for snow removal crews and the public during and after storms.

Snow poles are placed to accomplish the following:

- (1) Delineate culvert ends.
- (2) Delineate slope drains.
- (3) Mark beginning and end of dikes.
- (4) Mark beginning and end of guardrails.
- (5) Delineate bridge rails.
- (6) Delineate ramp gores.
- (7) Delineate median islands.
- (8) Delineate railroad grade crossings, and metal cattle guards.
- (9) Delineate miscellaneous obstructions to plows such as rock outcroppings.
- (10) Delineate objects that could be damaged by snow from rotary snowplows (cabins, homes, trailers, advertising signs, etc.).

(C) Color Coding of Snow Poles

The intent of this policy is to standardize the color coding of snow poles that is consistently throughout the State, to provide guidance for snow removal crews in identifying the above listed obstructions and objects within or near the right-of-way.

(1) Color Coding

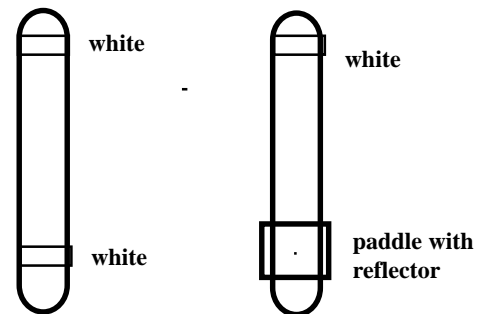
All snow poles shall be color coded with one or more bands of 3 inch (76.2 millimeters) wide high intensity type "Encapsulated lens" reflective sheeting (tape) wrapped around the pole with a minimum 1 inch (25.4 millimeters) overlap or painted with an approved reflective type paint.

References to placement of tape on poles are to top of tape.

Types of snow pole installations and their color coding are as follows: (Note: All references to "4 feet (1.2 meters) from ground" apply to freestanding poles only; delineators with extensions are not subject to tape at the 4 foot (1.2 meters) level.)

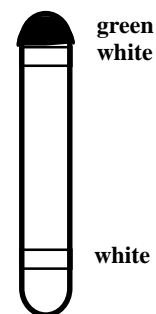
- (a) Standard Snow Pole Installation
(freestanding pole or guide marker and extension).

White tape 3 inches (76.2 mm) from top of pole and 4 feet (1.2 m) from ground.



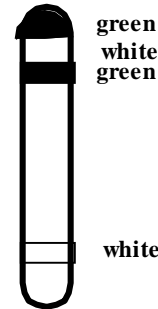
- (b) Culvert Marker

Green tape at top of pole, white tape 3 inches (76.2 mm) from top and 4 feet (1.2 m) from ground.



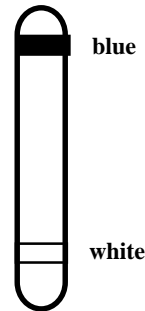
(c) Slope Drain

Green tape at top of pole, white tape 3 inches (76.2 mm) from top, green tape 6 inches (152.4 mm) from top, and white tape 4 feet (1.2 m) from ground.



(d) Roadside Obstructions (bridges, guardrail, curbs, dikes, etc.)

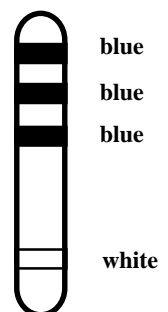
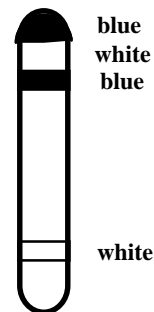
Pole at beginning of obstruction and continuing through obstruction, blue tape 3 inches (76.2 mm) from top of pole, and white tape 4 feet (1.2 m) from ground.



End pole, white tape 3 inches (76.2 mm) from top of pole and 4 feet (1.2 m) from ground (same as A).

(e) Highway Obstructions Requiring Plow to Stop (metal cattle guards, railroad grade crossings, etc.)

Pole 300 feet (91.4 m) ahead of obstruction, blue tape at top of pole, white tape 3 inches (76.2 mm) from top, blue tape 6 inches (152.4 mm) from top, and white tape 4 feet (1.2 m) from ground.



Pole at obstruction, blue tape 3 inches (76.2 mm), 9 inches (228.6 mm), and 15 inches (.381 m) from top of pole, and white tape 4 feet (1.2 m) from ground.

- (f) Rotary Snowplow Obstructions
(cabins, homes advertising signs, high voltage lines, transformers, frontage roads, ski trails, etc.)

Pole at beginning of obstruction and continuing through obstruction, orange tape at top of pole, white tape 3 inches (76.2 mm) from top, orange tape 6 inches (152.4 mm) from top, and white tape 4 feet (1.2 m) from ground.

End pole, white tape 3 inches (76.2 mm) from top of pole and 4 feet (1.2 m) from ground (same as A).



In order to minimize the danger to the neon type of advertising signs during snow removal operations, it is suggested that the protection of these signs be discussed with the owners prior to the start of the snow season. In some cases, wire screens have been installed by the owners, to provide protection against the discharge of snow from the right-of-way. It is often helpful to have the sign lights left on all night during the winter season to assist equipment operators in recognizing the unit. Where heavy snow removal requires use of rotary plows, the operators should be instructed to reduce speed in the areas where adjacent buildings or facilities might be damaged by the flying snow, and to direct the chutes to minimize this danger.

Care must be taken to avoid damaging cars parked adjacent to the highway.

(2) Type of Pole

Fiberglass slip in or add on type snow poles shall be used on guide markers.

Length may vary as required. (For detail regarding use of delineators, refer to Section 6 of the Traffic Manual.) These poles shall be black with an ultraviolet inhibitor to prevent them from bleaching to white or yellow.

Hat shaped or 1 inch (25.4 millimeters) black pipe, free standing type snow poles may be utilized in heavy snowfall, high altitude areas, or areas subject to extreme vandalism or theft.

Duplication of poles in an immediate area should be avoided; i.e., where one pole can perform several desired functions in lieu of more than one.

Maximum use of delineators supplemented with snow poles should remain the preferred method to reduce numbers of poles needed and to better perform roadside delineation.

(3) Placement of Snow Poles

The minimum number of poles necessary shall be utilized.

A 400 feet (122 meters) or more spacing between poles should be the goal, recognizing exceptions for areas of poor alignment, fog, and severe blowing and driving snow conditions.

In areas with low annual snowfall, it may be appropriate to delete snow poles and rely on existing guide markers only. Snow poles shall not be removed during the summer months unless there are compelling reasons to do so.

R.04 Equipment

In territories of light snowfall and lower levels of service, light dump trucks equipped with light push plows are recommended. Where the snowfall is heavy and the levels of service are higher, motor graders, heavy trucks 8 cubic yards and bigger with heavy (Type C) plows, rotary snow plows and heavy plow trucks equipped with exhaust heated slip in sander bins should be used.

On major routes, the main plow unit should be the 8 cubic yards and bigger sander truck (3-axle) equipped with Type C plows and wing plows. This increases production and cuts down on the amount of equipment needed. It is recognized that if pack is allowed to build up, the motor grader and heavy use of deicing chemicals may be necessary. Under-body mounted truck plows are faster than motor graders at cutting pack off and should be used if available. Reversible plows are utilized where it is necessary to push snow either to the right or the left.

Rotary plows are used to clean up deep berms of snow left on the shoulders and to open mountain pass roads that are allowed to close in the winter. Occasionally, drifts and avalanches are deep enough that rotaries are required. Large truck plows equipped with a wing plow, operated skillfully, can be used to minimize the rotary plow work that is slow and costly.

Two-way radios should be installed in all snow removal equipment, which operate in remote areas to provide rapid emergency communication as well as to promote more efficient snow and ice removal operations. Some low use equipment may be operated without installation of two-way radios, but may be equipped to use plug in or portable two-way radios.

R.05 Lights for Snow Equipment

In addition to normal lighting, snow removal equipment may be equipped with special lighting equipment. Examples include: revolving amber lights, flashing amber lights, blade lights, spotlights, and fog lights.

- (A) In addition to the normal lighting equipment, chain control trucks and trailers should have the following:
 - (1) Two 8 inch (203.2 millimeters) flashing red lights visible from the rear.
 - (2) Two 4 1/2 inch (114.3 millimeters) white flood lamps on the rear, so as to illuminate the overhead chain check point sign.
 - (3) One 36 inch (.91 meters) RI (STOP) sign mounted on right rear corner of truck. It should be removable for traveling, or mounted so it can be opened or closed to traffic.
- (B) Changeable message signs should be used when available to supplement other chain control equipment.

R.06 Care of Equipment

When snow removal equipment is idle, it should be kept in good condition for quick starting.

Sheltered quarters may be provided where necessary.

Particular attention is directed to those items requiring lubrication every 8 hours, regardless of length of working shift.

Tire chains shall be inspected frequently and promptly repaired when they become worn or damaged.

Equipment shall be inspected and Pre-Operation Checklists ("Pre-Ops") shall be filled out at the beginning of each shift. When shift changes occur out on the road and the equipment will not return to the maintenance station or shop, the operator shall review the latest Pre-Operation Checklist. Equipment shall be hosed-off with water and serviced as needed at the end of each shift. It is the responsibility of supervisors and operators to see that snow removal equipment is properly serviced and maintained in top operating condition.

Extreme care should be taken by operators to avoid hitting bridges, berms, guardrail or other obstacles that may be hidden by snow. Operators should be aware of overhead height obstructions.

R.07 Prevention of Drifts

Identify locations subject to drifting and take preventative measures. The *Snow Fence Guide* by Dr. Ronald D. Tabler (SHRP-W/FR-91-106), available from the Federal Highway Administration (FWHA), includes detailed instructions regarding snow fences and reduction of drift.

The *Snow Fence Guide* states that "plowing snow drifts costs about 100 times more than installing effective snow fences".

Proper trimming of trees may reduce drift formation at some locations. Planting of trees away from the roadway as outlined in the *Snow Fence Guide* is a cost effective and environmentally acceptable method of snow-drift reduction.

R.08 Snow Fences

Snow fence may serve a dual purpose. First, they reduce drifting problems. Second, they may decrease visibility problems where snow blows horizontally across the traveled way. Written permission of the property owner must be obtained where snow fence is installed on private property.

See Chapter C5 of this Manual, Section C5.20: Entry Upon Private Property, for instructions regarding permission to enter private property.

Snow fences shall be installed on the windward side of the road.

The proper position for fences will be determined by the conditions, as wind currents vary in each locality. See the *Snow Fence Guide* for additional guidance.

R.09 Protection and Handling of Traffic

It is the responsibility of Caltrans to determine chain requirements and post them.

Turnable permanent chain control signs shall be installed at strategic locations.

On heavily traveled major routes, flaggers and checkers may be necessary to aid in enforcing chain control and preventing excessive delay in the chaining up operation. CHP officers should be requested to aid in the enforcement aspects of chain control. In addition, district Traffic Operations personnel should be requested to help ensure the expeditious and orderly flow of traffic during chain control conditions through the application of traffic management techniques.

Private chain installers may be allowed if they are properly trained and have obtained the proper permits.

Often, mobile chain control units will be necessary due to rapidly changing conditions requiring changes in chain control locations. Portable highway advisory radios and changeable message sign units also may be necessary where traffic volumes are high.

It is absolutely mandatory that timely road condition reports be sent to the District Communications Center so that up-to-date road information is available to the public.

The Chain Requirements chart on page R-20 outlines standardized chain requirements. Under certain conditions, snow tires may be used on passenger vehicles in lieu of chains. However, those vehicles must carry chains of the correct size and type in case they are needed. Chain or snow tire requirements must be made known to the local Zone and Area Commanders of the California Highway Patrol for purposes of proper enforcement.

A supply of the chain requirement charts shall be furnished each superintendent for distribution to truckers or others who may be concerned, and to Maintenance personnel responsible for chain control requirements.

Chain control signs must be changed promptly as conditions warrant.

(A) Conditions During Which Standard Signs are Required

There are four conditions for which standard signing for chain control areas are necessary.

- (1) R1 A: The first condition may be used when road conditions are such that only single-axle drive vehicles with trailers need chains. (Commonly referred to as "Modified R1.") The sign shall be mounted below the CHAINS REQUIRED sign (R76).
- (2) R1: The second condition is when chains are required but autos and pickups with approved legal snow tires are excepted from using chains.

- (3) R2: The third condition is when chains are required but vehicles with four wheel drive and approved legal snow tires on all four wheels are excepted from using chains.
- (4) R3: The fourth condition is when chains are required with no exceptions.

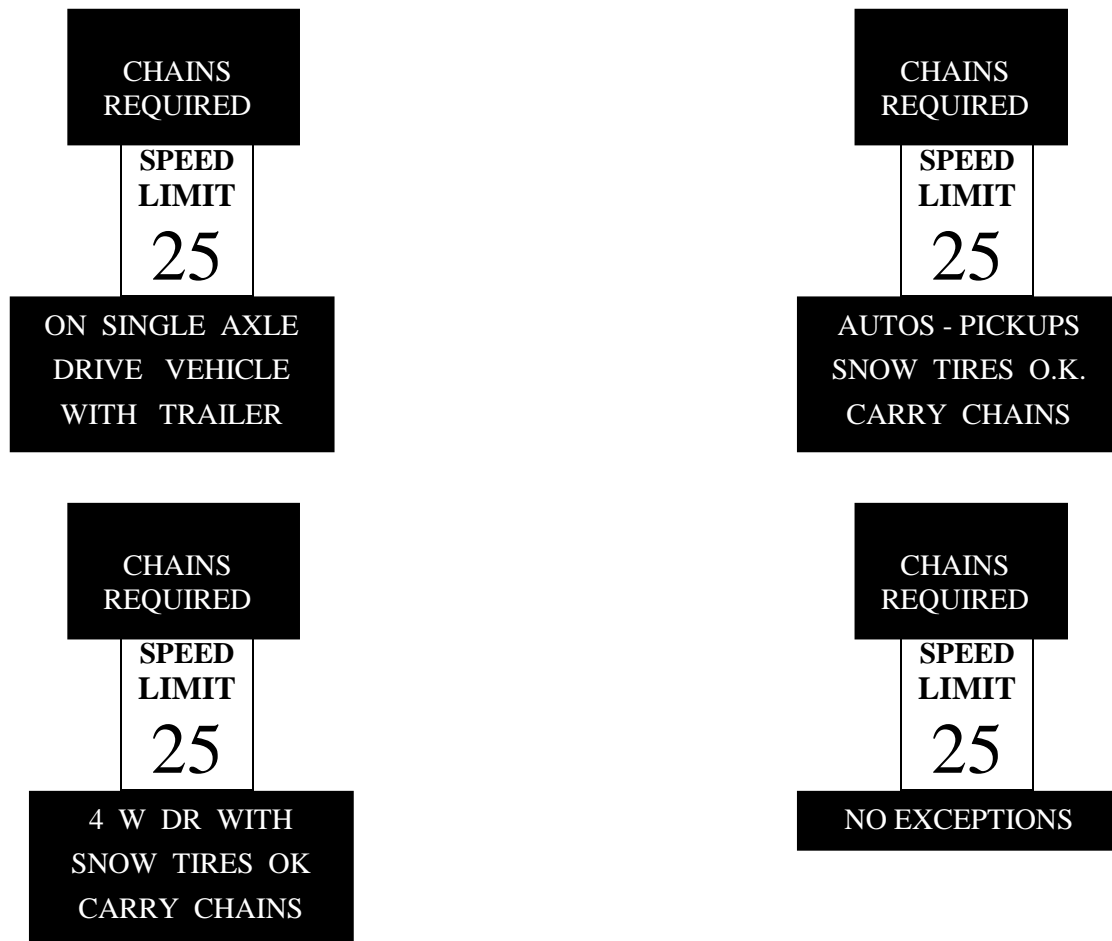


Figure R-2: Chain Requirements ("Speed Limit 25 (40.23km/h)" is for illustration only)

Speed limits may be set at 40, 35, 30, or 25 miles per hour (64.32, 56.33, 48.28, or 40.23 kilometers per hour) in chain control areas according to prevailing conditions as outlined in Section 22363 of the California Vehicle Code.

All designated areas should have "End of Chain Control" signs at the end of the chains required area.

R.10 Highway Condition Reports

Public information service during inclement weather requires the compiling of daily reports on highway conditions, snowfall, depth of pack, period of storm, and dates of highway opening and closing. November to April is the normal winter season. Timely snow and highway condition reports during this period are to be sent by microwave, leased line telephone (Calnet) or by facsimile to the Maintenance Program (Headquarters) as highway conditions change.

R.11 Parking Areas

As equipment becomes available after highway snow removal is completed, clearing of established parking areas on the right-of-way, and driveway berms, shall be done.

R.12 Sno-Parks

Normally, clearing of Sno-Parks shall proceed only after state highways are open and equipment and personnel can be made available for such work. Exceptions are Sno-Parks that are used for snowplow turn arounds, or where it is impractical or inefficient to return at a later time. All Sno-Park work shall be documented for reimbursement according to the properly executed agreement in effect at the time. Inter-Agency Agreements for Sno-Park work are administered by the Headquarters Maintenance Program.

R.13 Sand and Deicing Chemical Storage

Where ice, frost or snow causes slippery pavements, provisions for abrasives storage, shall be made. Abrasives may be stored in covered stockpiles in areas where a frozen crust will not form on the stockpile. Where large quantities are required and temperatures low enough to cause a frozen crust, a sand house or other structure may be provided. Deicing chemicals should be stored in covered areas, bunkers, abrasive storage buildings, or tanks, but they shall not be kept in equipment buildings. Abrasives and deicers should be stockpiled prior to and as needed during the winter season. Stockpiled material should be dry to prevent caking.

Deicing chemicals should be stored in compliance with the National Pollutant Discharge Elimination System (NPDES) standards. Contact the District NPDES (or Storm Water) Coordinator for further information on storm water pollution prevention measures.

R.14 Applying Deicing Chemical and Abrasives

Deicing chemicals and abrasives are spread to ensure the road is safe by providing increased traction to maintain an orderly flow of traffic during adverse weather conditions. Deicing chemical can be used to:

- (A) Prevent the formation of frost or ice films.
- (B) Weaken or prevent bonding between the snow pack and road surface.
- (C) Melt compacted snow that remains after plowing

Sodium chloride (salt) is very effective above 25° F (-12.6° Celsius), fairly effective between 25° and 15° F (-12.5° and -30.6° Celsius), marginal between 10° and 15° F (-39.6° and -30.6° Celsius). It is not effective at all below 10° F (-39.6° Celsius).

Because of potentially detrimental effects of sodium chloride to vegetation, water quality and corrosion of metal, highway maintenance personnel should use no more than the minimum amount necessary for effective snow and ice control as stated in the "Snow and Ice Control Policy". All deicing products are to be applied under the strict control and direction of the assigned supervisor on duty unless prior authorization for a specific use has been given. A Material Safety Data Sheet (MSDS) will be kept on file for each deicing product being used.

(A) Application Guidelines

The following guidelines should be used when applying salt (Sodium Chloride-NaCl).

SALT APPLICATION RATES

TEMPERATURE degrees Fahrenheit			RATE Pounds per lane mile (Kilograms per 1.6093 kilometers)		
With falling temp F	In shade	In sun	To prevent ice films or to weaken bond between snow and road surface	To remove thin crusts of snow and ice after plowing	To remove thick crusts of snow and ice
	25-up	20-25	50-200 (22.68 – 90.72)	150 (68.04)	300 (136.08)
25-up	20-25	10-20	100-200 (45.36-90.72)	150-250 (68.04-113.4)	300-400 (136.08-181.44)
20-25	10-20	5	125-250 (56.7-113.4)	250 (113.4)	500 (226.8)

Abrasives and/or chemicals will be used as needed on grades, curves, bridge decks, grade crossings, intersections, frost areas, and in cities and towns to improve vehicle traction.

Abrasives will ordinarily be applied at 1,000 lbs. (454 kilograms) or less per lane mile (1.6 kilometers). Up to 2,000 lbs. (907 kilograms) per lane mile (1.6 kilometers) may be required on super-elevations or under unusual conditions. Applications should be repeated as necessary.

Spreaders should be calibrated at the beginning of the snow season to provide accurate application rates. To spread the desired amount of chemical and abrasive for given conditions, it is essential that the driver knows the proper settings and speed to operate the equipment.

Spreaders should be re-calibrated following mechanical repair or indications of inaccurate spreading.

Sand and salt shall be spread using an approved sander or salt spreader. On lightly traveled roads, the sander may be adjusted so that the full width of the pavement is covered in one operation from the right-hand lane. However, on roads having considerable traffic, it may be necessary to shield the sander so that the sand will be spread on only one lane at a time.

Equipment used with sodium chloride should be washed and serviced at least once each shift and at all times immediately after each storm to prevent corrosion. Washing should only be done on approved rinse areas or wash racks.

R.15 Avalanche Control

Certain highways in California are located in areas that are prone to avalanches. There are three systems used to mitigate avalanche hazards by releasing them under controlled conditions.

- (A) GAZ-EX - a permanently mounted system of gas exploder tubes fired by remote control.
- (B) LoCAT - a semi-portable high pressure dry air propellant artillery type system.
- (C) Avalauncher - portable short range low pressure gas propellant artillery type system.

Explosive hand charges are used at remote locations under strictly controlled conditions when other methods are not appropriate or available.

Personnel involved in avalanche control shall be trained, licensed blasters certified to work with explosives.

Avalanche rescue beacons are provided to be worn at all times by Caltrans personnel working in avalanche prone areas. Two-way radios are used in all highway equipment and vehicles working in avalanche prone areas.

Specially designed jet roofs are ridge top structures used in some areas to redirect air currents to help prevent buildup of dangerous snow cornices. These are annually inspected and repaired to maintain structural integrity.

Caltrans works closely with the U.S. Forest Service, National Park Service, and private industry ski resort operators to ensure the public safety by posting warning signs and restricting off highway travel in avalanche prone areas.

In some areas, Caltrans may negotiate contracts or agreements with the U.S. Forest Service and/or private industry ski resort operators to perform avalanche control work to protect state highways.

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
CHAIN REQUIREMENTS
(revised 10/94)

The following vehicles are permitted in chain control areas when equipped with chains or Automatic Traction device (A.T.D.) as indicated:

AUTOS/PICKUPS:



- ▲ All vehicles towing trailers must have chains on one drive axle.
- Trailers with brakes must have chains on one axle.
- Front wheel drive vehicles must have chains on front (drive) axle.
- House trailers may be prohibited in severe snow conditions.

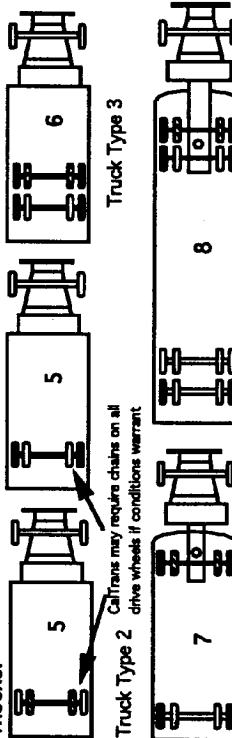
BUSES/RV's:



*Chains required on inside dual if possible
♦ Drive Axle must be chained

Note: Articulated buses must also chain outside wheels of last axle.

TRUCKS:



Tractor & Semitrailer Single Drive

Tractor & Semitrailer Type 3-S-2



Monotrailer Type 3-AS2



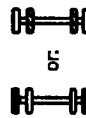
Tractor, Semitrailer & Trailer Type 3-S-2-T-2

LEGEND:

- Driving Axle
- Non-Driving axle
- Wheel with chains
- Wheel with chains or A.T.D.
- Wheel-no chains

THE DEPARTMENT OF TRANSPORTATION RESERVES THE RIGHT TO PROHIBIT ANY VEHICLE FROM ENTERING A CHAIN CONTROL AREA WHEN IT IS DETERMINED THE VEHICLE WILL EXPERIENCE DIFFICULTY IN SAFELY TRAVELING THE AREA.

Acceptable on either axle of semitrailers:



Approved 10/94

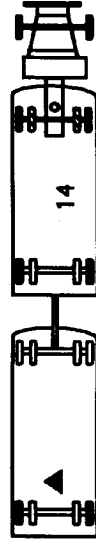


Truck & Trailer Type 3-T-3 or 3-T-2



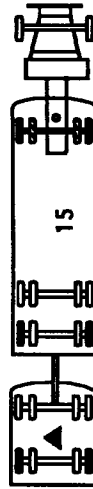
Truck Type 3 (with front drive axle)

♦ Drive Axle must be chained

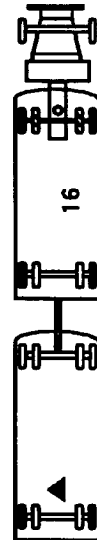


Tractor, Semitrailer & Trailer Type 2-S-1-T-2

THE FOLLOWING TRUCKS MAY BE RESTRICTED WHEN CHAINS ARE REQUIRED:



Tractor, Semitrailer & Trailer Type 2-S-2-T-2



Tractor, Semitrailer & Trailer Type 2-S-1-T-2

NOTES:

- On any semi-trailer only one set of chains required regardless of number of axles.
- ▲ Chains on trailers may be staggered front & back.
- Chains not required on tag axle.